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**Status of the
Loggerhead Shrike
(Lanius ludovicianus)
in Alberta**

**David R. C. Prescott
Ronald R. Bjorge**



Alberta Wildlife Status Report No. 24



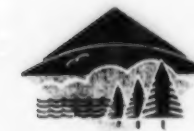
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PREFACE

Every five years, the Fisheries and Wildlife Management Division of Alberta Natural Resources Service reviews the status of wildlife species in Alberta. These overviews, which have been conducted in 1991 and 1996, assign individual species to 'colour' lists that reflect the perceived level of risk to populations that occur in the province. Such designations are determined from extensive consultations with professional and amateur biologists, and from a variety of readily available sources of population data. A primary objective of these reviews is to identify species that may be considered for more detailed status determinations.

The Alberta Wildlife Status Report Series is an extension of the 1996 *Status of Alberta Wildlife* review process, and provides comprehensive current summaries of the biological status of selected wildlife species in Alberta. Priority is given to species that are potentially at risk in the province (Red or Blue listed), that are of uncertain status (Status Undetermined), or which are considered to be at risk at a national level by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

Reports in this series are published and distributed by the Alberta Conservation Association and the Fisheries and Wildlife Management Division of Alberta Environmental Protection, and are intended to provide detailed and up-to-date information which will be useful to resource professionals for managing populations of species and their habitats in the province. The reports are also designed to provide current information which will assist the Alberta Endangered Species Conservation Committee to identify species that may be formally designated as endangered or threatened under the Alberta Wildlife Act. To achieve these goals, the reports have been authored and/or reviewed by individuals with unique local expertise in the biology and management of each species.

EXECUTIVE SUMMARY

The Loggerhead Shrike (Lanius ludovicianus) is a bird of open grasslands that are interspersed with trees and shrubs for nesting. Shrikes are unique among songbirds in that the diet of many species regularly includes vertebrate prey. Several subspecies of the Loggerhead Shrike occur across North America, with L. l. excubitorides occurring in Alberta and elsewhere on the Great Plains. The Loggerhead Shrike is included on the 'Yellow A List' of species that are experiencing long-term population declines, and may require specific management attention in the province.

The distribution of the Loggerhead Shrike has changed markedly since the beginning of European settlement in North America. In the mid-1880s, when land was extensively cleared for agriculture, the species expanded northward from the United States into eastern Canada. More limited northward expansion also occurred on the Canadian prairies around the turn of the century. The species reached its maximum range extension in the mid-1900s, and has since contracted to the point that it is now extirpated from most of eastern Canada and the northeastern United States. The range has also contracted in the prairie provinces, and the species has not recently been recorded in the Peace Parkland of Alberta where it occurred during the 1950s. Population size has paralleled reductions in the breeding range, with Breeding Bird Surveys showing a 3.1% annual decline in continental populations over the past 30 years, and a more rapid 10.1% annual decline in Canadian populations. There is some evidence that these declines have stabilized in the past decade, and populations may now be increasing in some areas, including Alberta.

It is believed that approximately 3000 pairs of Loggerhead Shrikes currently breed in Alberta, with most of these occurring south and east of Stettler. Although population declines may have stabilized in recent years, populations in Alberta and elsewhere may still be affected by habitat loss on the breeding and wintering grounds as well as toxic contaminants and human disturbance. It is therefore important to continue existing management initiatives for this species, and to monitor populations in the event that more intensive management intervention is required.

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INTRODUCTION

Two species of shrikes (Laniidae) occur in North America, but only the Loggerhead Shrike (*Lanius ludovicianus*) is unique to this continent. Shrikes differ from other songbirds in that their diet regularly includes small vertebrate prey. In the absence of a raptorial foot used by larger predatory birds to handle live prey, shrikes have evolved the unique tactic of impaling prey on sharp objects such as thorns and barbed wire. This behavior has earned the species the nickname 'butcherbird' (Yosef 1996).

Between seven and 11 subspecies of the Loggerhead Shrike have been identified based on range, morphology and plumage coloration (Miller 1931, American Ornithologists' Union 1957). However, there is general consensus that *L. l. excubitorides* is the subspecies that occurs in central North America, including Alberta. In this province, the Loggerhead Shrike is included on the 'Yellow A List*' of species that are not at immediate risk of extirpation, but may require specific management attention because of concerns about long-term population declines. Loggerhead Shrikes are considered to be 'threatened' in western Canada by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 1999).

The Loggerhead Shrike has been the focus of several recent investigations in Alberta. This report summarizes recent and historical information on the Loggerhead Shrike as a step in reviewing the species' status in this province.

* See Appendix 1 for definitions of selected status designations

HABITAT

Loggerhead Shrikes are birds of open places. Throughout their range, their habitat typically includes grasslands interspersed with scattered trees and shrubs that provide nesting and perching sites. A variety of habitats often occur within breeding territories, including cultivated cropland, transportation rights-of-ways, and shelterbelts (Cadman 1985, Telfer 1992, Prescott and Collister 1993, Collister 1994a, Bjorge and Prescott 1996, Yosef 1996). In Alberta, Bjorge and Prescott (1996) found that only 11.9% of shrike territories consisted of a single habitat type, compared to 38.9% of random locations. Shrikes typically hunt from dead trees, tall shrubs, utility wires and fences, and may impale their prey on sharp twigs, thorns, or barbed wire (Cadman 1985, Yosef 1996). These features may also be important components of habitat selection by the Loggerhead Shrike (Bohall-Wood 1987, Luukkonen 1987).

Although the general structure of shrike habitat is similar across the Loggerhead Shrike's North American range, specific elements vary geographically. In Ontario, for example, the major woody plant in shrike habitat is hawthorn (*Crataegus* spp.), and approximately two-thirds of shrike nests are found in this shrub (Campbell 1975). Nesting preferences in other areas, which likely reflect the local relative abundance of tree and shrub species, are: Osage Orange (*Maclura pomifera*) in Oklahoma and Illinois (Graber et al. 1973, Tyler 1992), Red Cedar (*Juniperus virginiana*) in Missouri (Kridelbaugh 1983), Alabama (Siegel 1980), Virginia (Luukkonen 1987) and South Carolina (Gawlik and Bildstein 1990), elms (*Ulmus* spp.), willows (*Salix* spp.), cottonwood (*Populus* spp.) and Russian Olive (*Elaeagnus angustifolia*) in Colorado (Porter et al. 1975),

and Lemonade Berry (*Rhus integrifolia*), Island Cherry (*Prunus lyonii*) and Toyon (*Heteromeles arbutifolia*) in California (Scott and Morrison 1990). In Alberta, and elsewhere on the Canadian prairies, the woody component of shrike habitat is usually Thorny Buffalo-berry (*Shepherdia argentea*), willow, or Common Caragana (*Caragana arborescens*; Cadman 1985, Collister 1994a). Collister (1994a) compiled information on 206 nest sites in Alberta (including those reported by Wershler 1989). Overall, 70.3% of nests were in Thorny Buffalo-berry, 9.2% in willow, 7.8% in caragana, and 3.9% in Manitoba Maple (*Acer negundo*). The remaining nests (8.8% of total) were found in 11 other species of trees and shrubs. Collister (1994a) also noted regional differences in the use of nesting substrates in Alberta. In particular, nests in the Red Deer River area tended to be in Thorny Buffalo-berry, whereas those in the Milk River area tended to be found in shelterbelt plantings (caragana and Manitoba Maple).

The species composition of grassland in shrike habitat also varies geographically, but the preferred ground cover in all areas is typically used for livestock grazing (Cadman 1985, Telfer 1992, Gawlik and Bildstein 1993). The importance of short grass (and grazing activity) in habitat selection by breeding shrikes has been highlighted by several researchers, especially those from the central and eastern United States (Kridelbaugh 1982, Luukkonen 1987, Bohall-Wood 1987, Brooks and Temple 1990b, Gawlik and Bildstein 1990). The preference for short grass appears logical, as shrikes rely heavily on insects that live in grassy areas, and the insects would be more easily detected and captured in short cover (Prescott 1992). In Alberta however, Prescott and Collister (1993) found that sites occupied by

Loggerhead Shrikes had a greater amount of tall grass (>20 cm) than did sites that were visually similar, but unoccupied. These results are not necessarily inconsistent with results from eastern and central North America, as 'tall' grass in the relatively arid climate of Alberta may be similar to 'short' grass in more easterly (and moist) areas of the continent. Nevertheless, shrikes will feed in relatively tall grass when available (Mills 1979, Prescott 1992, Collister 1994a), and may even have higher productivity in such areas (Blumton 1989). Shrikes have also been known to use cropland and bare ground for foraging (Luukkonen 1987, Blumton 1989, Telfer 1992, Collister 1994a), although these habitats would typically be found adjacent to grasslands and are unlikely to be critical components of shrike habitat. In fact, Luukkonen (1987) determined that occupied territories had more grassland and less cropland than expected by chance, and Telfer (1992) observed that major increases in cropland, and accompanying losses in grasslands, occurred in areas of Alberta and Saskatchewan where shrike populations had declined.

Shrikes from the northern portion of their breeding range winter in the central and southern United States and Mexico (see below). Here, as on the breeding ground, shrikes prefer expanses of grassland, sometimes interspersed with trees and shrubs (Telfer 1992). However, the dependence of wintering shrikes on woody growth is apparently less than during the breeding season. Telfer (1992) reported that 61% of shrikes observed in Texas during the winter were in grasslands devoid of trees and shrubs. In these areas, utility wires, rather than woody vegetation, were used as hunting perches.

CONSERVATION BIOLOGY

The Loggerhead Shrike is a medium-sized songbird with an average mass of about 48 g, and length of about 210 mm (Yosef 1996). Males and females are similar in plumage coloration and pattern, but males are slightly larger than females in most body measures (Miller 1931, Collister and Wicklum 1996).

In the southern parts of the species' range, the Loggerhead Shrike is a permanent resident, but in more northerly areas, including Alberta, the species is migratory (Miller 1931, American Ornithologists' Union 1983, Yosef 1996). Males arrive on the breeding grounds before females (Kridelbaugh 1983). The first arrivals are usually seen in Alberta by early April (Smith and Bjorge 1992), although Pinel et al. (1993) report records as early as 25 March, and Sadler and Myres (1976) list a record from Lethbridge on 10 March. Nests are built in a variety of trees and shrubs (see 'Habitat' section, above), at heights between 2 and 3.5 m (Yosef 1996), although Collister (1994a) reported an average height of 136 nests in Alberta to be 1.36 m. The female, alone, builds the nest (Miller 1931, Burton 1990) over a period of six to 11 days (Graber et al. 1973, Kridelbaugh 1983). The nest, which is generally a bulky cone of rootlets, forbs and bark strips lined with finer material (Yosef 1996), is generally concealed below the crown in a crotch or on a large branch (Bent 1950, Salt and Wilk 1958). Kiliaan (1996) documented a pair of shrikes nesting in a roll of wire in Alberta.

Smith and Bjorge (1992) report that clutch initiation in Alberta peaks in mid-May. The average clutch size of 120 nests discovered by Collister (1994a) in southeastern Alberta was 6.3, with a range of four to nine eggs. This

value is larger than has been reported in many other areas of North America, and is consistent with a trend for clutch sizes to be larger in the northern and western parts of the Loggerhead Shrike's breeding range (Yosef 1996). An incubation period of about 16 days has been calculated in a variety of geographic areas, including Florida (Lohrer 1974), California (Miller 1931), Colorado (Porter et al. 1975) and Alberta (Collister 1994a), although this period has been shown to range from 14 to 20 days in Alberta (Collister 1994a). Incubation begins after the laying of the second-last or third-last egg (Kridelbaugh 1983). Only the female incubates (Miller 1931, Collister 1994a), and most food consumed by females during this period is provided by males. Nests are rarely parasitized by Brown-headed Cowbirds (*Molothrus ater*). De Geus and Best (1991) reported three such incidences in Iowa.

In southeastern Alberta, the peak of hatching is between 2 and 10 June (Collister 1994a). Because incubation begins before clutches are complete, eggs typically hatch asynchronously, with the last eggs hatching about two days after the first (Kridelbaugh 1982, Luukkonen 1987, Novak 1989). The size asymmetry among young results in the larger, more aggressive chicks receiving disproportionate amounts of food from parents, and often death by starvation or siblicide of smaller and younger nestlings (Kridelbaugh 1982, Luukkonen 1987, Novak 1989, Burton 1990). The nestling period generally lasts about 17 to 20 days (Miller 1931, Lohrer 1974, Porter et al. 1975, Siegel 1980, Kridelbaugh 1983, Tyler 1992). Yosef (1996), who summarized data on 2034 nests from 15 studies, reported overall nest success of 56%. However, success in Alberta appears somewhat lower. Specifically, Collister (1994a) reported 48.7% success (n=36) in 1992, and 37.8% (n=28) in 1993. Adults may

renest after failure of the first nesting attempt (Yosef 1996). Collister (1994a) noted 12 such incidences over a two-year study in southeastern Alberta. Replacement nests are typically built within 100 m of the first nest (Collister 1994a). Even if a nest is successful, many young die before reaching independence (i.e., 3-4 weeks after nest departure; Kridelbaugh 1983). Collister (1994a) reported that between 33 and 53% of young died within the first 10 days of nest departure. Chabot (1994) found that approximately half of fledged young survived to independence in eastern Canada.

Loggerhead Shrikes consume a wide variety of vertebrate and invertebrate prey, and appear to adjust diet to local prey availability (Miller 1931, Craig 1978). Numerically, invertebrates make up the largest part of the diet, especially during the breeding season. Stated percentages of invertebrates in the diet include 72% (Bent 1950), 72% and 88% in eastern and western U.S., respectively (Beal and McAtee 1912), 66% in Indiana (Burton 1990), and 86% in California (Scott and Morrison 1990). However, vertebrates make up a larger part of the winter diet (up to 76%; Graber et al. 1973, Kridelbaugh 1982), and probably make up the greatest percentage of biomass of the diet at all times of the year (Scott and Morrison 1990). Generally, small mammals and birds make up the majority of vertebrate prey (Yosef 1996), although small reptiles and amphibians are also consumed (Scott and Morrison 1990, Yosef and Grubb 1993). In Alberta, vertebrate prey are primarily Thirteen-lined Ground Squirrels (*Spermophilus tridecemlineatus*), Meadow Voles (*Microtus pennsylvanicus*), and Sagebrush Voles (*Lagurus curtatus*; Collister 1994a).

By late August, most birds have departed from

Alberta for wintering grounds in the southern United States and Mexico (Smith and Bjorge 1992), although sightings as late as 5 November have been made (Sadler and Myres 1976, Pinel et al. 1993). Birds apparently migrate individually, travel during the day, and move short distances at a time while feeding on route (Yosef 1996). Band recoveries from the Canadian prairies indicate that breeding birds from this area may winter primarily in Texas and Oklahoma (Burnside 1987). Two birds banded in Alberta in 1933 were recovered during the winter in central Texas (Burnside 1987), and one bird banded near Atlee (70 km NE of Brooks) in June 1992 was recovered in March 1995 at Fort Hood, Texas (D. Collister, pers. comm.). It is possible that birds from the Canadian prairies also migrate into Mexico, but the dearth of observers in that country reduces the probability of obtaining band recoveries south of the continental United States.

Studies in Alberta and Manitoba show that only 1.2% and 0.85%, respectively, of juveniles returned in the year following banding, whereas 32% and 16%, respectively, of adults returned (Collister and De Smet 1997). Of the returning birds, juveniles moved a mean distance of 14.7 km from their natal site. The average dispersal distance for adults was substantially less (2.7 km), and not significantly different between males and females (Collister 1994a). Given these values for return rates and dispersal distances, it is not surprising that even in the areas of highest shrike concentration in Alberta (Jenner-Bindloss area; see 'Population Size and Trends' section, below), there is a high population turnover. Collister (1994a) found that only 40% of birds present in this area in 1994 were either adults that bred, or young that were produced, in that same area in 1992.

There have been few attempts to quantify the

annual survivorship of Loggerhead Shrikes, and estimates are confounded by the fact that birds that do not return to breed on a study site in a given year are generally assumed to have died, even though they may have moved to other areas and therefore have been undetected. Miller (1931) believed that annual survivorship was about 50%, but this estimate was based on the observation that about half of birds on the wintering grounds are juveniles. Brooks and Temple (1990a), calculated annual adult survivorship as 47%, based on territory reoccupancy rates, and the assumption that if an adult survived, it would return to the same site to breed in subsequent years. The authors speculated that low winter survival, possibly a result of habitat loss in the southern United States, was the main factor reducing annual survivorship. Collister (1994a) examined return rates within an area of Alberta that encompassed the maximum expected dispersal distance between years, and estimated annual adult survival of about 40%. The maximum age reported for the Loggerhead Shrike is 12.5 years (Klimkiewicz et al. 1983).

DISTRIBUTION

1. Alberta. - The historical distribution of Loggerhead Shrikes in Alberta has not been well documented, but has evidently changed over the last century in response to human land use patterns (Telfer 1992). Telfer (1992) believed that shrikes occurred throughout the Prairie and Aspen Parkland regions, where frequent fires reduced woody encroachment and provided suitable foraging and nesting habitat. A reduction in fire frequency that accompanied human settlement may have reduced habitat suitability in the Aspen Parkland (Telfer 1992), but the simultaneous intensification of agricultural activities in more northerly areas may have encouraged the

northward expansion of the breeding range in Alberta (Salt and Wilk 1958), and elsewhere on the Canadian prairies (Cade and Woods 1997). The northerly range expansion reached a peak by the mid-1950s (Figure 1), when the species was reported breeding at Fairview and Falher in the Peace Parkland (Salt and Wilk 1958). Loggerhead Shrikes were also reported as far west as near Waterton Lakes National Park (Rand 1948), although the late date of this record (28 August 1939), suggests that it may have been of a migrating individual.

Since the 1950s, the breeding range of the Loggerhead Shrike in Alberta has contracted southward. Breeding Bird Surveys (BBS, see Robbins et al. 1986 for overview of survey) last detected Loggerhead Shrikes in the Athabasca region in 1973, and by the early 1980s, almost all reports of Loggerhead Shrikes along BBS routes were from areas south and east of Drumheller (Collister 1994b). A combination of records (n=707) collected since 1987 from the Alberta Breeding Bird Atlas project (Semenchuk 1992), and from the Biodiversity/Species Observation Database (maintained by Alberta Natural Resources Service and the Alberta Conservation Association), shows that over the past decade, the vast majority of Loggerhead Shrike records occurred between 50.5 and 52.5°N, and east of 113°W (i.e., from Stettler and Gleichen to the Saskatchewan border; Figure 1). There is also a concentration of records in the extreme southeastern part of the province (Onefour-Manyberries region). Records in the Aspen Parkland are relatively sparse, although a few records extend as far north as Athabasca and Lac La Biche, and west to Drayton Valley and Sundre (i.e., into the adjacent Boreal Natural Region).

The only published winter record for Alberta

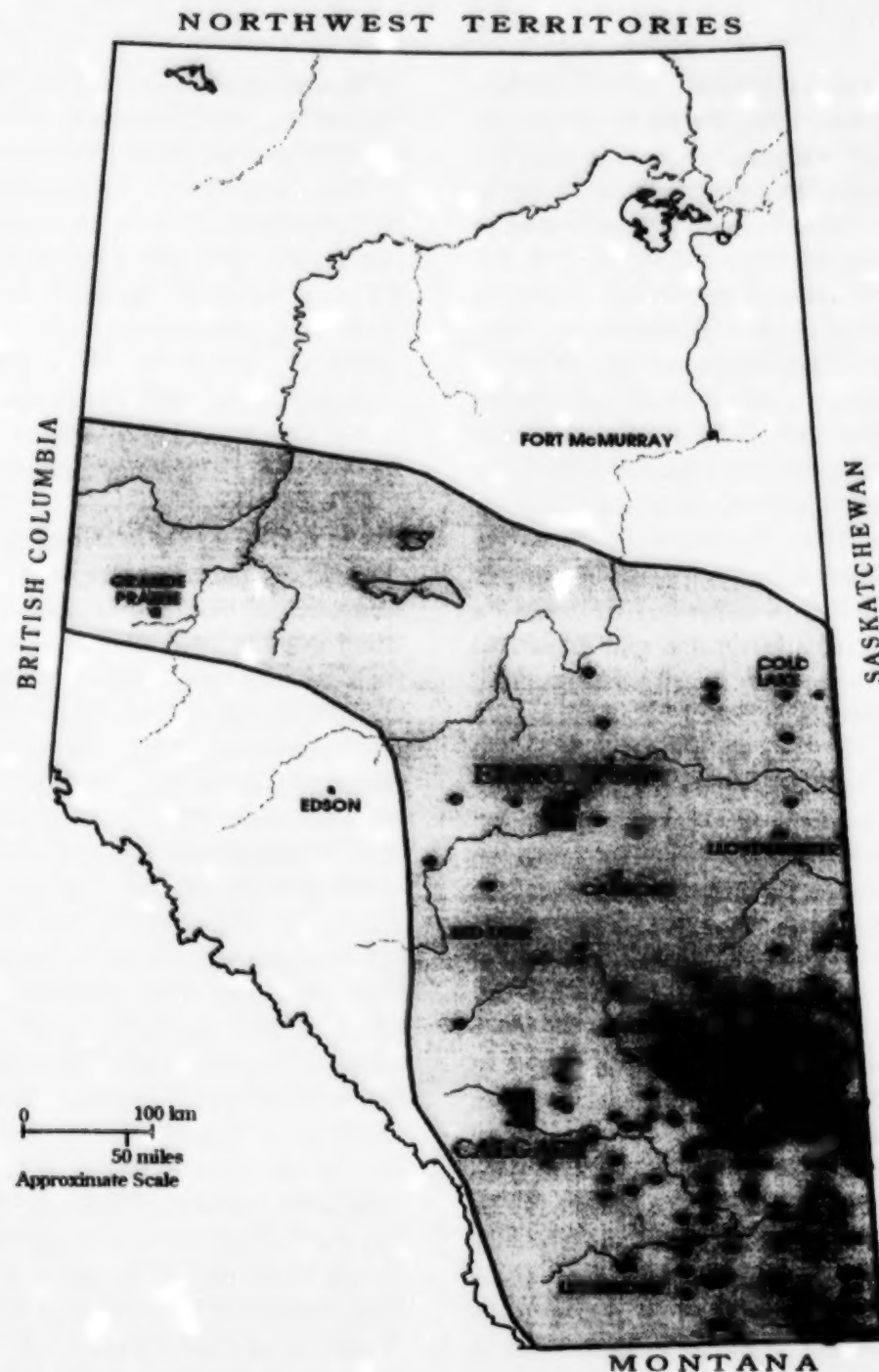


Figure 1. Distribution of the Loggerhead Shrike in Alberta. The shaded area is the maximum range extension recorded in the 1950s (Salt and Wilk 1958). Dots represent sightings (n=707) reported since 1987 by the Alberta Breeding Bird Atlas project (Semenchuk 1992) and the Biodiversity/Species Observation Database maintained by the Alberta Conservation Association and Alberta Environment.

occurred at Okotoks on 22 February 1974 (Pinel et al. 1993).

2. Other Areas. - As in Alberta, the continental breeding distribution of the Loggerhead Shrike has undergone substantial changes since the first human settlement. These changes have been particularly evident in eastern North America, when the clearing of forests for agriculture led to a northward expansion of the historical breeding range in the extreme southeastern United States (Cade and Woods 1997; Figures 2A and B). By the mid-1800s, the species had expanded into New York State (Bull 1974) and Maine (see Cade and Woods 1997), and was first reported in southern Ontario in 1860 (McIlwraith 1886), and around the same time in Quebec (with first reported breeding around 1880; Robert and Laporte 1991). By the early 1900s, the Loggerhead Shrike had expanded north and eastward through central Ontario, southern Quebec, and into New Brunswick (Macoun and Macoun 1909) and Nova Scotia (Tufts 1961). Range expansions on the prairies have not been as dramatic. However, it is likely that the species' northern range limits in this region were extended with the clearing of aspen forests for agriculture (Salt and Wilk 1958, Cade and Woods 1997). The species' range in the westernmost parts of North America appears to be relatively unchanged since human settlement (Cade and Woods 1997).

The Loggerhead Shrike reached its maximum range extension by the 1940s in most areas of eastern and central North America (Cadman 1985, Hands et al. 1989, Robert and Laporte 1991, Cade and Woods 1997). At its maximum extension, the range spanned from western Nova Scotia and southern New Brunswick across southern Quebec and Ontario as far north as North Bay, Thunder Bay and Kenora,

through southern Manitoba and Saskatchewan as far north as Nipawin and Meadow Lake, and to the Rocky Mountains as far north as Fairview, Alberta (see Cadman 1985). The range also extended southward throughout the United States (with the exception of higher elevations in the western Cordillera and Appalachian regions; Cade and Woods 1997), and into Mexico as far south as Oaxaca and Veracruz (American Ornithologists' Union 1983; Figure 2B). The species has also been reported breeding at Churchill, Manitoba (Grinnell and Palmer 1941, Jehl and Smith 1970), and has been observed (with no evidence of breeding) in extreme southern British Columbia (Cadman 1985).

Over the past 40 years, the northern limit of the Loggerhead Shrike's breeding range has contracted (Figure 2C). The species has gradually disappeared from most areas in the northeastern United States and eastern Canada, to the point where it is now a sporadic breeder north of Virginia (Cade and Woods 1997). Less than 30 pairs now breed in southern Ontario, and no breeding has been reported in Quebec since the mid-1990s (M. Cadman, pers. comm.). The species has been extirpated from traditional breeding areas in the maritime provinces, Maine, New Hampshire, Massachusetts, Connecticut and Rhode Island (Cadman 1985). The breeding range has also contracted southward on the Canadian prairies (Cadman 1985), and has become more sporadic in the north-central United States (Hands et al. 1989). The distribution in westernmost North America has not contracted to the extent observed in other areas of the continent, but land-use practices have undoubtedly had both a positive and negative influence on local shrike distributions in this area (Cade and Woods 1997).

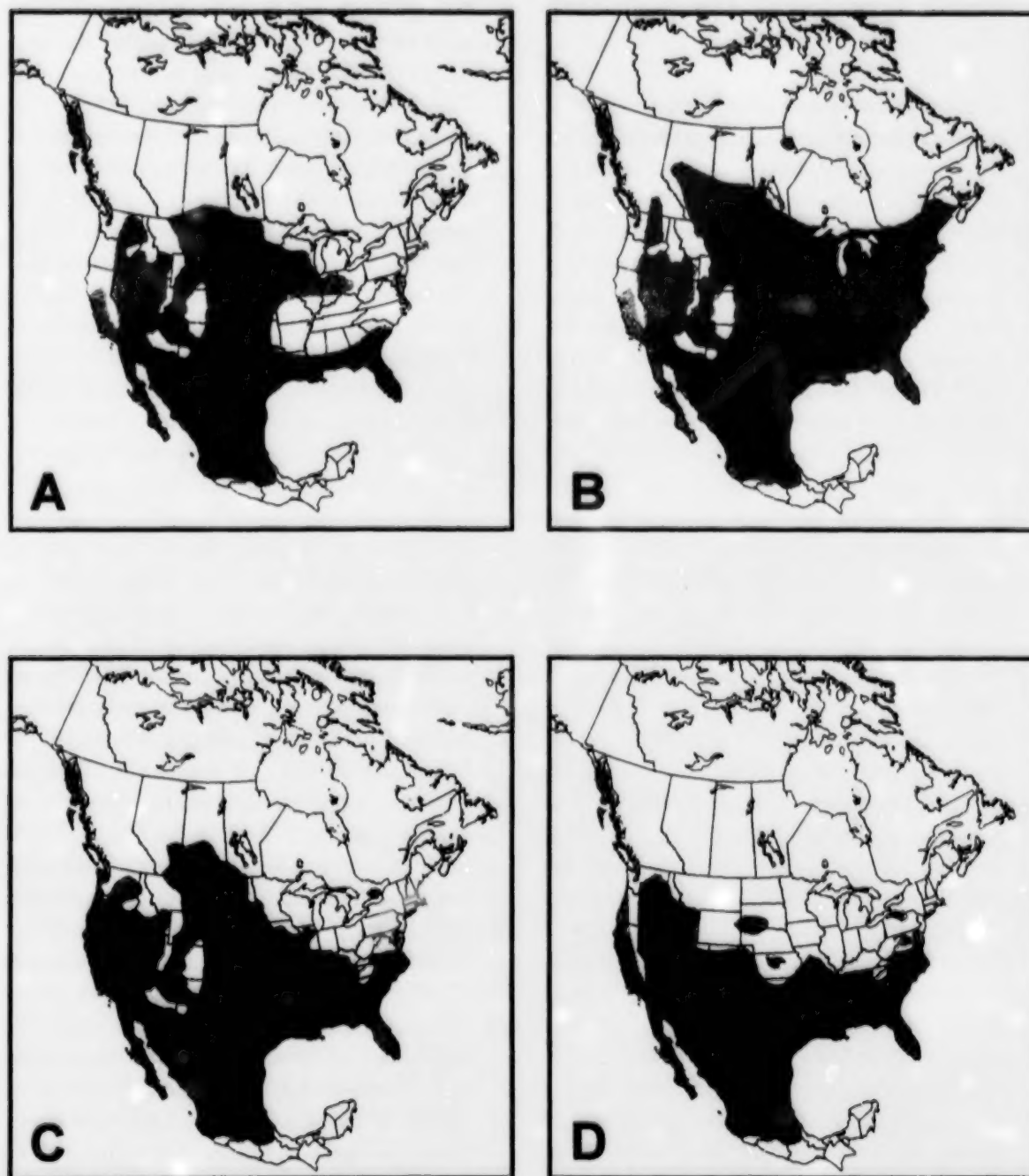


Figure 2. Distribution of the Loggerhead Shrike in North America. A: historical breeding range (prior to European settlement); B: maximum breeding range extension (mid-20th century); C: current breeding range; D: current winter range (after Sauer et al. 1996, Cade and Woods 1997).

Birds from northerly populations migrate southward into areas occupied by sedentary populations for the winter. The winter range extends from the southern limit of the breeding range (south-central Mexico), north through the United States as far as central Washington and Idaho, southeastern Wyoming, central Nebraska, Iowa and Illinois, southern Indiana, Ohio and Pennsylvania, with sporadic records as far north as the Canadian border (American Ornithologists' Union 1983, Sauer et al. 1996; Figure 2D). The species has also been recorded as a winter vagrant in the Bahamas, Bermuda, and Guatemala (see references in Yosef 1996).

POPULATION SIZE AND TRENDS

1. Alberta. - Early accounts of Loggerhead Shrike populations in Alberta did not attempt to estimate population size, but indicated size in relative terms. Salt and Wilk (1958) referred to the Loggerhead Shrike as a "common resident" of the province. During the 1940s the species was considered to be "not uncommon" in the Elk Island National Park area east of Edmonton (Soper 1951) and "common" at Camrose (Farley 1932). Rand (1948) found the species to be "rather uncommon" in southern Alberta as a whole, but "not uncommon" near Brooks. The species was considered "numerous in migration" near Edmonton in 1964 (Sadler and Myers 1976). Stepney (quoted in Cadman 1985) indicated the species was more common in southern Alberta than in central parts of the province.

A variety of approaches have been used to numerically estimate the size of the Loggerhead Shrike population in Alberta. The first estimate was based on complete counts of known populations, with some extrapolation to the province as a whole. Using this approach, Wershler (1989) estimated 300-400 pairs of

shrikes in Alberta. In July 1987, Telfer et al. (1989) conducted a roadside census for shrikes through most of the known Alberta range. The survey, which was conducted along 200-300 km transects by observers driving at 50-70 km/hr, suggested that there were "fewer than 1000 pairs" of Loggerhead Shrikes in Alberta. Collister (1994b) estimated 1084 pairs for Alberta based on abundance codes reported by participants in the Alberta Breeding Bird Atlas project (see Semenchuk 1992). A substantially higher estimate was determined by Bjorge and Prescott (1996), who conducted complete counts of 26 randomly selected (41.5 km²) blocks over a 23,600 km² area of core shrike range in southeastern Alberta. The population in this area was estimated to be 2477 pairs, with a 95% confidence interval of 1588 to 3365 pairs. As the study area comprised only about 1/3 of the species range in Alberta (Semenchuk 1992), the provincial population was believed to be as high as 5000 pairs. Bjorge and Prescott (1996) also determined that only 32.9% of birds in the study blocks would potentially have been detected by a roadside census. If so, then the roadside census results provided by Telfer et al. (1989) would suggest a provincial population of near 3000 pairs. In short, there is some uncertainty about the size of the provincial breeding population, although an estimate of about 3000 pairs would seem reasonable. There is general agreement, however, that the highest shrike concentrations in the province occur in a corridor along Highway 555 between Jenner and Bindloss (approximately 80 km north of Medicine Hat; Telfer et al. 1989, Wershler 1989, Collister 1994a).

Although a firm estimate of the number of Loggerhead Shrikes breeding in Alberta has not been attained, it is apparent that the provincial population has declined in recent

years. These trends are best quantified by Breeding Bird Survey data collected in Alberta, and elsewhere in North America, since 1966. BBS data show that between 1966 and 1996, populations in Alberta declined at a nonsignificant rate of 6.0% per year (Sauer et al. 1997; Figure 3A). However, populations declined significantly only during the first half of this period (10.5%/year from 1966-1980), whereas the population has shown an average annual (nonsignificant) increase of 13.8%/year since that time (Sauer et al. 1997).

It is important to note that BBS routes have historically been concentrated in the southern part of Alberta (i.e., core range of the Loggerhead Shrike in the province). Therefore, provincial trends calculated from BBS data probably underestimate the true decline in numbers as the recent extirpation of birds in the most northerly parts of the provincial range (see 'Distribution' section, above) would not be included in the data set. Furthermore, calculated increases since 1980 may be less meaningful than longer-term data as shrikes have been observed on fewer routes in recent years (Collister 1994b). In an attempt to clarify population trends in the province, R. Bjorge (unpubl. data) analyzed shrike observations on the same BBS routes over three, nine-year periods between 1968 and 1994. These analyses were conducted separately for areas south and north of 52°N, which approximates the interface between the Aspen Parkland and Grassland Natural Regions (Strong and Leggat 1992). South of 52°N, shrike numbers decreased from 0.60/route-year (number of routes times years BBS conducted) during 1968-76 to 0.40 during 1978-85 and 0.38 during 1986-94 ($n = 9$ routes, 185 route-years and 85 observations of shrikes). North of 52°N, shrikes decreased from 0.26/route-year in 1968-76, to 0.07 during 1977-86 and 0.0 during

1986-94 ($n = 10$ routes, 180 route years and 18 observations of shrikes). These data indicate that during 1968-94, Loggerhead Shrikes were most common south of 52°N, and the decline which occurred during that period was more severe in the Aspen Parkland than in the Grassland Natural Region of Alberta.

A variety of data point to stable populations in Alberta during the 1990s. Collister (1996), compared numbers of breeding pairs in prime habitat along the Canadian Pacific Rail/Highway 555 right-of-way between Atlee and Cavendish in 1996 with observations he made in the same area during 1992 and 1993. No changes in population size were apparent. Bjorge and Kiliaan (1997) compared numbers of breeding shrikes observed on 12, 41.5 km² study blocks inventoried in 1993 (Bjorge and Prescott 1996) and again in 1996 (R. Bjorge, unpubl. data). Sixty-one pairs were observed in 1993, compared to 65 pairs in 1996. In 1998, R. Bjorge (unpubl. data) compared densities in a further 13 study blocks first censused in 1993 (Bjorge and Prescott 1996). Again, numbers during the two periods were comparable, with 50 pairs being observed in 1993, and 53 in 1998. Finally, 16 roadside routes originally inventoried in 1987 (Wershler 1987, Telfer et al. 1989) were resurveyed in 1998 (R. Bjorge, unpubl. data). The number of indicated pairs along these routes increased from 20 in 1987 to 65 in 1998, suggesting a local increase in population size. However, some of this increase could be associated with differences between observers, as biologists in Alberta have become much more familiar with Loggerhead Shrikes over the past decade.

In summary, the number of Loggerhead Shrikes have declined in Alberta. However, it appears that most of the decline occurred prior to 1980, and was most severe in the Aspen Parkland

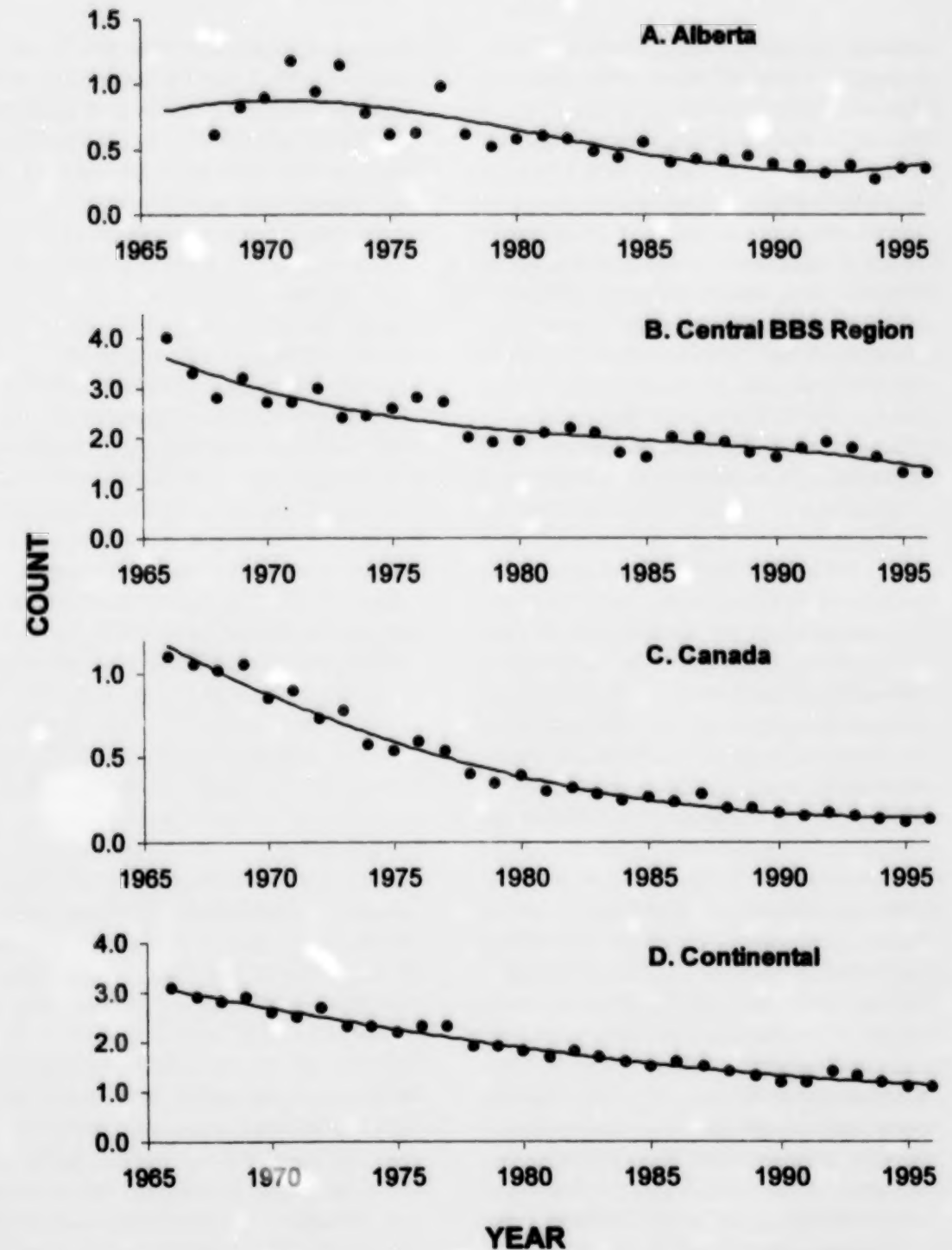


Figure 3. Trends in Loggerhead Shrike populations since 1966, as calculated from Breeding Bird Survey data (Sauer et al. 1997).

Natural Region. Loggerhead Shrike populations remained strong in the Grassland Natural Region and were relatively stable in that region during the 1980s and 1990s.

2. Other Areas. - As already noted (see 'Distribution' section, above), the distribution of the Loggerhead Shrike has undergone dramatic changes since European settlement. Overall population size likely paralleled changes in range, although it is difficult to compare historical and recent population sizes because of differences in the number of observers and the level and standardization of survey effort (Hands et al. 1989). Nevertheless, shrikes appear to have expanded into the northeastern United States and eastern Canada in the 1800s, and were generally described as being common through to the mid-1900s in this area (see accounts in Cadman 1985 and Yosef 1996), as well as throughout the north-central United States (Hands et al. 1989). Population declines in many areas were first noticed in the 1930s and 1940s (Cade and Woods 1997), but have been particularly dramatic since the 1970s. During the past three decades, the species has been extirpated from much of its range in northeastern North America (Yosef 1996), has declined to very low levels in eastern Canada (<50 pairs in Ontario [Cuddy 1995], and none in Quebec [M. Cadman, pers. comm.]), and has become more patchy in the north-central (Hands et al. 1989) and south-eastern (Cade and Woods 1997) United States. Compared to other areas of Canada, populations in the prairie provinces remain large, with an estimated 7000 pairs breeding in Saskatchewan (W. Harris, pers. comm.), and up to 300 pairs in Manitoba (De Smet 1994; see above for estimates from Alberta).

Although the Breeding Bird Survey was initiated (1966) several decades after

population declines were first observed, analysis of BBS surveys confirm that shrikes have declined in most areas of North America over the past 30 years. For example, of 31 states or provinces with sufficient data for trend calculation, only one jurisdiction (Colorado) shows increasing populations (4.0%/year; Sauer et al. 1997) over this period. Declines in other areas, although not always statistically significant, range as high as 15.4%/year (North Carolina), but generally fall within the range of 3% to 5%/year. Populations in the central Breeding Bird Survey region, which includes most of the range of *L. l. excubitorides*, have declined less rapidly (3%/year; Figure 3B) over the past 30 years than have populations in the eastern and western BBS regions (both 4.1%/year). However, Canadian populations have shown the most dramatic declines (10.1%/year; Figure 3C), which is much higher than the decline for the continental population (3.6%/year; Figure 3D, Sauer et al. 1997).

Despite widespread population declines over the past 30 years, there is evidence that trends are slowing or reversing in many areas. For example, for the period 1966-1979, 27 of 30 jurisdictions with sufficient data showed declining populations, with only Colorado (0.3%/year), Oregon (0.3%/year), and South Dakota (4.4%/year) showing increasing populations of shrikes. Between 1980 and 1996, however, only 19 of 31 states or provinces had declining populations. Furthermore, the rate of decline had decreased in 22 of 30 jurisdictions between the two time periods, and had changed from a decline to an increase in nine jurisdictions. Only one state (South Dakota) showed a change from positive growth (4.4%/year) in 1966-1979 to a decline (-1.1%) in 1980-1996. At the regional level, populations declined in all areas in both the 1966-1979 and 1980-1996 periods, but rates

of decline were lower in all areas during the latter time period (eastern: -3.5 vs. -1.7%/year; central: -4.4 vs. 1.9%/year; western: -8.1 vs. -1.6%/year). These moderating declines have also been noted for Canadian populations as a whole, where declines during 1966-1979 were 4.4%/year, but populations increased during 1980-1996 (5.5%/year).

Breeding Bird Surveys also provide a measure of relative abundance of Loggerhead Shrikes in different areas of North America. In eastern parts of the continent, populations generally increase along a north-south gradient, with few routes north of Tennessee/North Carolina supporting more than one bird per 40 km route. The highest populations (up to 10 birds/route) are found in relatively small areas in central Florida and coastal Louisiana. In central regions, abundances of 1-3 birds/route occur throughout most of the Great Plains (including southern Saskatchewan and Alberta), with areas of up to 10 birds/route occurring primarily in parts of Texas, Oklahoma, Kansas, Colorado and New Mexico. In the western United States, abundance generally increases from north to south, with the highest populations (up to 10 birds/route) occurring in southern California (Sauer et al. 1997).

Estimates of population size on the wintering grounds have been calculated from Christmas Bird Count (CBC; 1959-1988) data. Loggerhead Shrikes reach their highest abundances in southern and central Texas, southern Louisiana, and central Florida (up to 30 birds/count; Sauer et al. 1996) where populations are comprised of both year-round residents and seasonal migrants from more northerly latitudes. Root (1988), in an earlier analysis of CBC data, showed the highest abundances in Texas and southern Alabama. Morrison (1981) analyzed CBC data from five

regions of the United States for two time periods (1955-60, and 1974-78), and concluded the following trends: Pacific Coast - stable to slight decline; Southwest - stable; Southern Great Plains - slight to moderate decline; Central Southeastern - slight decline; and Southeastern Coast - moderate to severe decline. An analysis of CBC data by Sauer et al. (1995) showed an overall population decline of 1.6%/year on the wintering grounds between 1966 and 1989, with the greatest declines (up to 6%/year) occurring in parts of Georgia, North and South Carolina, New Mexico, Arizona, Utah and California. To date, population trends for birds wintering in Mexico have not been determined.

LIMITING FACTORS

1. Habitat Alteration and Intraspecific Competition. - Cade and Woods (1997) examined conclusions from 18 Loggerhead Shrike studies and noted that the majority pointed to habitat loss and fragmentation on the breeding grounds as important factors in declining populations. In particular, the intensification of farming operations including the conversion of native grasslands and trees to cultivated croplands has been implicated in reducing shrike nesting and foraging opportunities (Cadman 1985) and decreasing productivity (De Smet and Conrad 1989). Farms during the early to mid-1900s were relatively small with a considerable amount of grassy pasture where shrikes thrived (Novak 1989). Telfer (1992) concluded that in those portions of the Canadian prairie provinces where Loggerhead Shrike declines had been the greatest, there was a 39% decline in unimproved pasture (native grasslands) between 1949 and 1986. In areas where substantial numbers of shrikes remained, there had been only a 12% decline in occurrences of

unimproved pasture. Some authors (Luukkonen 1987, Brooks and Temple 1990b) have argued that ample breeding habitat is available and does not limit shrike populations. However, Prescott and Collister (1993), who compared visually-similar occupied and unoccupied shrike habitat in Alberta, found that occupied sites contained taller grass than unoccupied sites. This supports the hypothesis that Loggerhead Shrikes may be limited by availability of suitable habitat.

Loss of habitat on the winter range is also a concern (Telfer 1992, Johns et al. 1994). Loggerhead Shrikes that breed in the Canadian prairie provinces winter in the southern United States and possibly Mexico (Johns et al. 1994). Overwintering shrikes in central and southern Texas commonly inhabit grasslands (Telfer 1992), but by 1979, only 17% of pre-settlement native grassland remained in that state (Jurries 1979). Shrikes that migrate to Texas and surrounding areas may face competition from resident shrikes for a decreasing amount of optimal habitat (Lymn and Temple 1991). Apparently, resident shrikes set up their winter territories before arrival of migrants and are aggressive to conspecifics (Miller 1931). Telfer (1992) speculated that loss of high quality foraging habitat to encroachment of brush and agriculture may contribute to increased mortality as shrikes are forced to travel greater distances in search of foraging sites. Mortality rates for wandering passerines during winter have been documented to be significantly higher than for more sedentary ones (Rappole et al. 1989). Shrikes may also face competition from other species on the wintering range including American Kestrels (*Falco sparverius*), which eat similar prey items (Bildstein and Grubb 1980).

2. Toxic Contaminants. - The Loggerhead

Shrike's position near the top of the food chain puts it at a high risk of accumulating chemical residues (Cadman 1985). Also, the shrikes' habit of first eating the head and brain of prey, may increase pesticide intake (Miller 1931). The continental decline in Loggerhead Shrike abundance coincided with introduction and increased use of organochlorides between the 1940s and 1970s (Cadman 1985, Yosef 1996). The decline also corresponded with initial use of dieldrin for grasshopper control (Campbell 1975). Anderson and Duzan (1978) found that egg shells of shrikes in Illinois were thinner in 1971-72 than in 1875-95 and that there was a significant negative relationship between DDE (a metabolite of DDT) concentrations and shell thickness of recent eggs. About 88% of 69 birds from Illinois contained an average concentration of 21.9 ppm DDE, with spring and summer concentrations being higher than concentrations from birds collected during fall and early winter. Rudd et al. (1981) detected DDT concentrations of 200 ppm in the skin, brain and fat of shrikes in California, which was 200 to 400 times higher than that of insect prey. Busbee (1977) observed that with 2 ppm dieldrin in their diet, all young shrikes died within 103 days. In 1974, Campbell (1975) found high DDT and PCB levels in Loggerhead Shrike eggs and nestlings in Ontario.

It should be noted, however, that no studies have produced evidence of a direct effect of chemicals on Loggerhead Shrike populations (Cade and Woods 1997), and it is likely that most effects on shrikes were indirectly caused by a reduction in prey (Yosef and Lohrer 1995). Fortunately, the use of organochlorides is no longer widespread (Cadman 1985).

3. Weather/Climate. - Climate change and inclement weather may be a source of significant mortality for young shrikes at the

northern fringe of the species' range in Alberta. In Alberta, about 80% of nests in the Jenner area failed during a period of cool weather and heavy rain (Collister 1994a), and Tyler (1992) attributed poor fledgling success in 1985 and 1987 in Oklahoma to inclement weather. At cooler temperatures, attacks on prey also declined significantly due to reduced availability of some prey species (Craig 1978). In Missouri, rainfall and cool temperatures during fledging caused complete loss of 8 of 28 broods (Kridelbaugh 1983). Cadman (1985) concluded that further research was needed into the relationship between climate trends and declines in Loggerhead Shrike numbers. He noted that the cooling trend which occurred throughout much of North America between the 1930s and 1970s did not occur in the southwestern United States or Texas, where shrike numbers remained stable during that period.

4. **Predation.** - Predation is a natural phenomenon for Loggerhead Shrikes (Kridelbaugh 1983, Collister 1994a), but is also influenced by the activities of man. For instance, Loggerhead Shrikes are most commonly found near human-created corridors like roadsides (Luukkonen 1987, Bjorge and Prescott 1996) and fencerows (Yosef 1994), and mortality for shrikes in these areas can be higher than in more natural habitats (Luukkonen 1987, Yosef 1994). De Geus (1990) and Yosef and Yosef (1992) suggested that linear habitats attract predators because prey are located with greater ease and efficiency. Predation may also be an important influence on shrike populations on the wintering grounds, where habitat availability is declining (Telfer 1992), and birds are forced into marginal areas or to wander (Miller 1931, Rappole et al. 1989).

5. **Human Disturbance.** - The effects of direct human disturbance on breeding birds has not been well documented (Chabot 1994). Loggerhead Shrikes appear to be quite tolerant of human activity around the nest site (Cadman 1985, Collister 1994a), but will abandon the nest if disturbed during egg-laying or incubation (Cadman 1985). Death from vehicle collisions may be an important source of mortality in heavily populated areas such as southern Ontario (Cadman 1985). Miller (1931) stated that collision with wires and roads "may out-weigh the benefits derived from the use of perches and impaling posts provided through the presence of roads". He noted that between two and seven percent of the shrikes he studied in California were killed by vehicles each year. Collisions with vehicles is not considered a problem in Alberta, where most shrikes occur in relatively unpopulated areas (Smith 1991, Collister 1994a). Shooting may once have been a significant cause of mortality in Loggerhead Shrikes, but such losses have likely decreased in recent years.

STATUS DESIGNATIONS

1. **Alberta.** - The Loggerhead Shrike was classified as a 'Red List' species (see Appendix 1) in 1991 (Alberta Fish and Wildlife 1991), based on the belief that there were probably fewer than 500 breeding pairs in the province, and that populations were likely declining. In a more recent review of the status of Alberta wildlife (Alberta Wildlife Management Division 1996), the species was placed on the 'Yellow A List' of species that are not currently at risk, but for which there is concern about long-term decline in numbers. This change in designation was made because the provincial population was larger than previously thought (probably closer to 2500 pairs). The species is ranked as 'S3' by the Alberta Natural Heritage

Information Centre, because of its restricted and local distribution in the province (ANHIC 1999).

2. Other Areas. - Following a review by Cadman (1985), the Loggerhead Shrike was determined to be 'threatened' at the national level by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). This designation was based primarily on widespread declines in breeding populations in Canada and the United States. A subsequent update (Cadman 1990) led to the up-listing of populations in eastern Canada (*L. l. migrans*) to 'endangered' because of critically low and declining population size. As of 1999, populations in eastern and western Canada remain on the endangered and threatened lists, respectively (COSEWIC 1999), although the status of the western population is currently being reviewed (D. Collister, *in prep.*).

According to The Nature Conservancy's Natural Heritage Program criteria (The Nature Conservancy 1999), the Loggerhead Shrike is classified as 'S4B' in Saskatchewan (J. Keith, pers. comm.), 'S2/S3B' in Manitoba (Duncan 1996), and 'S2B' in Ontario (see Appendix 1 for explanation of ranks; B refers to breeding populations). The species is also listed as 'endangered' in Ontario (Ontario Ministry of Natural Resources 1999). Despite being virtually extirpated from Quebec, the Loggerhead Shrike apparently does not yet have special status in that province (Environnement et Faune Quebec 1998). Ratings in the maritime provinces are currently being prepared (Atlantic Canada Conservation Data Centre 1999).

The Loggerhead Shrike occurs in most states in the continental United States, although it has recently been extirpated from several

jurisdictions in the northeastern part of the country (see 'Distribution' section, above). The Loggerhead Shrike has not been assigned an official status by the U.S. Fish and Wildlife Service, with the exception of the subspecies (*L. l. mearnsi*) on San Clemente Island, California, which is officially designated as 'endangered' (Anonymous 1977). The species is listed as 'sensitive' by the U.S. Forest Service, but not as a 'sensitive' or 'watch' species by the Bureau of Land Management (see Montana Natural Heritage Program 1999).

Natural Heritage Program ratings, and other regional designations, have been determined for most parts of the United States (see The Nature Conservancy 1999 and associated links). The species is listed as being of special concern in most areas of the northwestern U.S. (e.g., 'S3B' in Washington and Idaho, 'S4B' in Montana and Oregon), and is either unlisted or not of concern in all other states west of the Mississippi, with the exception of being 'watch-listed' ('S3/S4B') in Colorado, and 'threatened' in Minnesota. East of the Mississippi, the status of the Loggerhead Shrike clearly follows a latitudinal trend. In the northeast, the species has been extirpated from several jurisdictions, and is listed as extirpated ('SHB'), critically imperiled ('S1B') and/or endangered in Vermont, New Hampshire, Delaware, New York, Indiana, New Jersey, Maryland, Massachusetts, Illinois, Michigan and Wisconsin. Further south, the ranking improves to 'S2' in Virginia, to 'S3' in both South and North Carolina, and 'S4' in Alabama. The species is not listed as being of concern in Florida.

Globally, populations of the Loggerhead Shrike are considered to be secure, with a rating of either 'G5' or 'G4/G5', depending on the specific source (The Nature Conservancy 1999).

RECENT MANAGEMENT IN ALBERTA

Knowledge and activities related to Loggerhead Shrikes in Alberta increased markedly during the 1980s and 1990s. During this period there was widespread understanding that Loggerhead Shrikes were declining throughout most of their range (Robbins et al. 1986, Erskine et al. 1992). This led to classification of the species as 'threatened' in Canada in 1986 and 'endangered' in eastern Canada in 1991 (Johns et al. 1994). Activities related to the management of Loggerhead Shrikes in Alberta have occurred on several fronts, including planning, habitat management and education, research and population inventory. Details related to population inventory have been outlined previously (see 'Population Size and Trends' section, above).

1. Planning. - During the late 1980s, Alberta Environmental Protection initiated a series of management plans for species at risk, including the Loggerhead Shrike (Smith and Bjorge 1992). Although this series of plans never achieved official status, they did provide a synthesis of current knowledge. The Loggerhead Shrike management plan outlined the need to determine population status in Alberta and to initiate management and education programs.

In 1988, the Wildlife Ministers Council of Canada endorsed a new strategy to deal with wildlife species at risk of extinction, and to prevent others from becoming at risk. This program, called RENEW (Recovery of Nationally Endangered Wildlife), brought together agencies, organizations and individuals to focus on the recovery of species at risk. The strategy focused on species or populations designated by the Committee on

the Status of Endangered Wildlife in Canada. A Loggerhead Shrike recovery team was initiated in Canada as part of this process, with membership from Alberta, Saskatchewan, Manitoba, Ontario, the federal government and several nongovernment agencies. The recovery plan for Loggerhead Shrikes (Johns et al. 1994) outlined population targets and management actions related to recovery. The western and eastern representatives of this team meet yearly to monitor progress and plan action for the coming year.

During 1998, the Alberta government initiated an Endangered Species Conservation Committee consisting of about 20 stakeholders to advise the minister on matters related to the status of species at risk in the province. A scientific sub-committee has been established to advise the stakeholder committee. The work of this committee will include a review of the status of the Loggerhead Shrike in the province (i.e., this document). This review may lead to future management actions.

2. Habitat Management and Education. - In 1994, Operation Burrowing Owl, a program of the Alberta Fish and Game Association, expanded its mandate to provide a more complete emphasis on the prairie ecosystem. The program was renamed Operation Grassland Community. Although specific management agreements have not been signed with landowners concerning shrike conservation, considerable literature and other information is distributed to landowners and other individuals. During the springs of 1996 to 1999, approximately 1400 Thorny Buffalo-berry shrubs were planted along the Canadian Pacific rail line between Bassano and Tilley by Operation Grassland Community partners and volunteers, to serve as nesting habitat for shrikes.

Loggerhead Shrikes and other species have benefited from several additional programs which strive to protect prairie habitat. The first of these is the habitat protection program of Alberta Environmental Protection, where biologists provide direct input into land use decisions on crown land. Examples of this program include providing input into stocking rates and grazing management on crown pastures, positioning oil and gas wells and pipelines away from critical habitat, and fencing old shelterbelts to exclude livestock.

The Prairie Conservation Forum (Bradley and Wallis 1996), which evolved from the Prairie Conservation Action Plan (World Wildlife Fund 1989), is a consortium of stakeholders with a strong interest in the grassland ecosystem. This program has heightened awareness of concerns within the prairies and facilitated greater communication among stakeholders. This has provided spin off benefits to shrikes and other components of the ecosystem.

Partners in Habitat Development, initiated in 1998, is a habitat program developed to enhance biodiversity within the Eastern Irrigation District. Key partners include the Eastern Irrigation District, Pheasants for Tomorrow, Alberta Conservation Association, Natural Resources Service, Ducks Unlimited Canada, County of Newell, Prairie Farm Rehabilitation Administration, and Brooks and District Fish and Game Association. As part of this program, shrubs including Thorny Buffalo-berry and rose are planted in areas not used for intensive agricultural activities. This will benefit a multitude of species including Loggerhead Shrikes.

The Canadian Pacific right-of-way between Jenner and Empress supports very high

numbers of nesting shrikes. Several agencies including University of Calgary (D. Collister), Alberta Chapter of The Wildlife Society, and Alberta Environmental Protection have contacted Canadian Pacific concerning the importance of this habitat, the need to preserve it, and the fate of the right-of-way should the line be abandoned. Currently (1999), Canadian Pacific is planning to dispose of the rail line. The Special Areas Board and partners are negotiating with the corporation to purchase the right-of-way, with the intention of keeping it as wildlife habitat (J. Slemm, pers. comm.).

In 1995, Alberta Environmental Protection published several thousand copies of a brochure on Loggerhead Shrikes as part of the 'Alberta's Threatened Wildlife' series. This document outlines status, description, habits, biology, limiting factors, management and outlook for the species. This brochure has been widely distributed among land owners and others. Several popular articles have been written outlining aspects of the ecology of shrikes in Alberta (e.g., Lynch 1993, Bjorge 1994, Collister and McKinley 1995).

3. Research. - Collister (1994a) conducted investigations of breeding ecology and habitat preservation along the Canadian Pacific right-of-way in the Buffalo area during 1992 and 1993. Additional publications stemming from this work include those related to trapping techniques (Collister and Fisher 1995), habitat preservation (Collister and Henry 1995), intraspecific variation (Collister and Wicklum 1996) and breeding and natal dispersal (Collister and De Smet 1997). Prescott and Collister (1993) investigated vegetational characteristics of used and unused breeding habitat in this same area and concluded that occupied sites contained a higher proportion of tall grass. Prescott (1992) found that foraging

attempts within territories were disproportionately directed towards areas of taller grass cover, and believed that such areas may provide the most profitable foraging sites. Bjorge and Prescott (1996) assessed the utility of estimating populations based on random sampling techniques within one third of shrike range in Alberta. H. Kiliaan and E. Telfer (unpubl. data) examined shrike productivity in southeastern Alberta during 1992 and 1993.

SYNTHESIS

The distribution and abundance of the Loggerhead Shrike in Alberta, and elsewhere, has been dynamic since human settlement accelerated in the late 1880s. Shrike populations evidently expanded in the province near the turn of the century, as land was cleared for agriculture. The range (and population size), subsequently contracted so that at the end of the 20th century, the species occurs primarily in the Grassland Natural Region in the southeastern part of the province, and probably numbers about 3000 pairs. Although the species is currently 'threatened' in western Canada (COSEWIC 1999), and is on the 'Yellow A' list of species in Alberta that may require some management because of recent declines in the population, declines in populations in Alberta, and in other parts of central and western North America appear to have slowed or stabilized. Furthermore, our

estimates of current population size are well in excess of the provincial target of 1000 pairs suggested by the *National Recovery Plan for the Loggerhead Shrike* (Johns et al. 1994). Accordingly, it may be premature to launch large-scale, intensive management programs for Loggerhead Shrikes in the province (see Johns et al. 1994 for complete list of possible management actions), at the expense of initiatives directed to other species that are in more imminent danger of extirpation. However, initiatives to enhance or retain known habitats should continue as a major activity to help minimize future population declines.

We caution, however, that recent estimates of population size have been derived from a variety of techniques, all of which rely on extrapolations from surveys that have been relatively limited in terms of effort or geographical representation. A high priority should therefore be to accurately and definitively determine the size of the provincial breeding population via rigorous surveys that cover most or all of the known range in the province. This, in conjunction with ongoing trend-monitoring programs such as the Breeding Bird Survey and periodic roadside and block surveys, will clearly define the status of the Loggerhead Shrike in Alberta, and will help steer future management efforts for this species in the province.

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APPENDIX 1. Definitions of selected legal and protective designations.

A. Status of Alberta Wildlife colour lists (after Alberta Wildlife Management Division 1996)

Red	Current knowledge suggests that these species are at risk. These species have declined, or are in immediate danger of declining, to nonviable population size
Blue	Current knowledge suggests that these species may be at risk. These species have undergone non-cyclical declines in population or habitat, or reductions in provincial distribution
Yellow	Species that are not currently at risk, but may require special management to address concerns related to naturally low populations, limited provincial distributions, or demographic/life history features that make them vulnerable to human-related changes in the environment
Green	Species not considered to be at risk. Populations are stable and key habitats are generally secure
Undetermined	Species not known to be at risk, but insufficient information is available to determine status

B. Alberta Wildlife Act

Species designated as 'endangered' under the Alberta Wildlife Act include those defined as 'endangered' or 'threatened' by *A Policy for the Management of Threatened Wildlife in Alberta* (Alberta Fish and Wildlife 1985):

Endangered	A species whose present existence in Alberta is in danger of extinction within the next decade
Threatened	A species that is likely to become endangered if the factors causing its vulnerability are not reversed

C. Committee on the Status of Endangered Wildlife in Canada (after COSEWIC 1999)

Extirpated	A species no longer existing in the wild in Canada, but occurring elsewhere
Endangered	A species facing imminent extirpation or extinction
Threatened	A species likely to become endangered if limiting factors are not reversed
Vulnerable	A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events
Not at Risk	A species that has been evaluated and found not to be at risk
Indeterminate	A species for which there is insufficient scientific information to support status designation

D. United States Endangered Species Act (after National Research Council 1995)

Endangered	Any species which is in danger of extinction throughout all or a significant portion of its range
Threatened	Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range

E. Natural Heritage Element Rarity Ranks (after The Nature Conservancy 1999)

Global or G-rank: Based on the range-wide status of a species.

Sub-national or S-rank: Based on the status of a species in an individual state or province. S-ranks may differ between states or provinces based on the relative abundance of a species in each state or province.

G1 / S1	Critically imperiled because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction
G2 / S2	Imperiled because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extinction throughout its range
G3 / S3	Either very rare or local throughout its range, or found locally in a restricted range (21 to 100 occurrences)
G4 / S4	Apparently secure, though it might be quite rare in parts of its range, especially at the periphery
G5 / S5	Demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery

B - A rank modifier indicating breeding status for a migratory species.

N - A rank modifier indicating non-breeding status for a migratory species.

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